Description

The invention relates to a braking- and damping device, in particular for movable pieces of furniture, having a fluid-cylinder in which two pistons are arranged in linearly displaceable manner, wherein a piston is displaceable over a piston rod.

With modern furniture, braking- and damping devices are being used increasingly in order to prevent a door of a piece of furniture which is slammed shut too forcefully or a drawer which is pushed into a furniture frame with too much force from hitting the end wall of the furniture frame. The oldest damping devices were formed from simple rubber buffers. More recently, pneumatic and hydraulic braking- and damping devices have been used.

In the case of drawers, they are preferably combined with a drawing in device. Also, doors or flaps are in many instances provided with hinges which have a closure mechanism which are then responsible together with the damping device for an optimum course of movement.

In the case of fluid damping devices, i.e. pneumatic or hydraulic damping devices with a linearly movable piston it has been seen that with high speeds or large volumes the damping effect of the fluid is insufficient to brake the moving piece of furniture adequately.

US-PS 4877226 therefore proposed a fluid damping device with a linearly movable piston which the piston radially expanded during the damping operation and pressed against the cylinder wall, so that in addition to the damping effect caused by the fluid frictional damping occurred between the cylinder and piston.

The aim of the invention is to create a pneumatic or hydraulic braking- and damping device of the kind mentioned in the introduction, wherein improved sealing between the piston and cylinder wall is achieved, and wherein spring-back during braking by the cushion of air, or cushion of fluid, occurring in the cylinder is avoided.

The problem of the invention is solved in that arranged between the two pistons is an elastically deformable sealing member, which, when damping occurs, is deformed by being squeezed between the two pistons and pressed against the cylinder wall.

Advantageously, it is provided that the piston which is displaceable linearly over a piston rod has an open cavity at the front face thereof into which the second piston is introduced, wherein the second piston is mounted in the first piston in freely displaceable manner, and, on the outer casing, has an annular projection which is disposed in front of the first piston, and arranged between the annular projection and the front face of the first piston is the sealing member which is in the form of a sealing ring.

Advantageously, it is further provided that provided in the cavity of the first piston are abutments which delimit the path of displacement of the second piston.

One embodiment of the invention provides for at least one elastic spacer to be provided between the floor of the cavity of the first piston and the rear side of the second piston.

Another embodiment of the invention provides for the sealing member to be designed as a cylindrical solid body made from a rubber elastic material or as a cylindrical bellows. The cylindrical shape exists therein in the unloaded state. When loaded, the sealing member becomes compressed and deformed.

There will now follow a description of various embodiments of the invention with the aid of the accompanying drawings, wherein:

Figure 1 shows a longitudinal section through the piston and the cylinder of a braking- and damping device according to the invention, in the ready position,

Figure 2 and Figure 3 each shows a longitudinal section through the piston and the cylinder of Figure 1, wherein the pistons are shown during the braking path, and

Figure 4 shows a longitudinal section through the pistons and the cylinder, wherein the pistons are shown at the end of the braking path,

Figure 5 shows a longitudinal section through the pistons and the cylinder, wherein the pistons are shown in the restoring phase,

Figure 6 shows a longitudinal section through a cylinder piston unit according to another embodiment of the invention,

Figure 7 shows section A of Figure 6, wherein the piston is shown in the damping position,

Figure 8 shows section A of Figure 6, wherein another embodiment of a piston is shown in the damping position,

Figure 9 shows the same cut-out section as Figure 7, wherein the piston is shown in the ready-, or restoring, position,
Figure 10 shows the same cut-out section as Figure 8, wherein the piston is shown, once again, in the ready-, or restoring, position.

The braking- and damping device according to the invention has a cylinder 1 in which a piston 2 is arranged in linearly displaceable manner. Therein, the piston 2 is provided with a piston rod 3. The piston rod 3 forms a plunger which is preferably acted upon by the movable piece of furniture. By way of example, the cylinder 1 is secured to the side wall or a piece of furniture, or to the top or floor of a piece of furniture, and in such a way that a closed door or end panel of a closed drawer abuts on the head 4 of the piston rod 3.

In the embodiment according to Figures 1 to 5, the piston 2 is provided with an open cavity 10 in the front face thereof, into which cavity a second piston 5 is inserted.

The first piston 2 has an annular projection 8 on the inside which acts as an abutment for delimiting the path of the second piston 5. During the relative rearward movement of the piston 5, the abutment is formed by the floor 11 of the cavity 10 in the piston 2.

The piston 5 is likewise provided with an annular projection 16 which forms a counter-abutment, and, when the piston 5 is disposed in the frontmost position in relation to the piston 2, rests upon the annular projection 8.

The piston 5 may be made of a plastics material, for example, and formed on the rear side of the piston 5 is at least one spacer 20 which bears in at least one recess 21 in the floor of the cavity 10 in the piston 2.

The front face 9 of the first piston 2 is inclined and extends from the centre of the pistons 2, 5, inclinedly to the rear, viewed with respect to the cylinder wall 7.

The ready position of the braking- and damping device is shown in Figure 1. The pistons 2, 5 are disposed at the upper end of the cylinder 1.

The term, "upper" is used here in relation to the drawings.

The piston 5 is held by the spacer 20 at a spacing from the floor 11 of the cavity 10, and the sealing member which is in the form of a sealing ring 6 is disposed with a certain clearance between the front face 9 of the piston 2 and an annular projection 22 of the piston 5. If a door of a piece of furniture or an end panel of a drawer strikes the head 4 of the piston rod 3, the pistons 2, 5 are pushed down in the cylinder, and, as can be seen from Figure 2, the spacer 20 is pushed down.

When this happens, the sealing ring 6 is squeezed, deformed in cross-section, and pressed against the inner wall 7 of the cylinder 1.

The cylinder wall 7 is provided with axially extending ribs 15 which permit the passage of air when the piston 2 is disposed in the frontmost position.

In so doing, the pistons 2, 5 are pressed apart by the spacer 20 (see Figure 4).

The piston 5 is provided with a skirt 19 consisting of a rubber-like or elastomer material, which preferably skims the inner wall 7 of the cylinder 2.

On the rear side of the piston 2, the cylinder 1 has air intake openings 23, and on the front side a return valve 12 with a discharge opening 13.

During damping, air is only able to escape slowly through the relatively small opening 13.

When the pistons 2, 5 are withdrawn by the spring 14, i.e. are returned to the ready position, the return valve 12 opens and air, or another fluid, is able to flow unhindered into the cylinder 1.

In the embodiment shown, the second piston 5 is also provided with a cavity 25 which is open towards the front.

In the embodiments shown in Figures 6 to 10, an elastically deformable sealing member is also arranged between the pistons 2, 5.

In the embodiment according to Figures 7 and 9, the elastically deformable sealing member is formed by a solid body 18 consisting of rubber-elastic material. This solid body 18 has projections 27 by means of which it is anchored in recesses 26 in the piston 2.

During the damping operation, i.e. when the piston 2 is being pressed into the cylinder 1 over the piston rod 3, the solid body 18, as shown in Figure 7, is compressed between the piston 2 and the piston 5 and pressed against the cylinder wall 7, whereby in addition to the damping caused by the fluid damping caused by friction takes place.

The piston 2 is provided with a seal 30 which bears against the cylinder wall 7. As a result, the resistance to fluid in the cylinder 1 is increased.

In the embodiment according to Figures 8 and 10, a bellows 17 is provided instead of a solid body 18.

The bellows 17 has angled edges 28 by means of which it is anchored in slots 29 in the pistons 2, 5.

In the embodiment shown in Figures 6, 8 and 10, a compression spring 31 is provided between the pistons 2, 5 which pushes the pistons 2, 5 apart again after damping has occurred.

The cavity 32 surrounded by the bellows 17 can contain a hydraulic fluid, e.g. oil.

The outer side of the bellows 17 is provided with annular ribs 24 which improve adhesion of the bellows 27 to the cylinder wall 7.

During the damping process, the pistons 2, 5 are compressed, as shown in Figure 10, and the bellows 17 is pressed with greater intensity against the cylinder wall 7, giving rise to the effect of additional damping caused by friction.

The damping device according to the invention is preferably designed as a pneumatic damping device, e.g. a damping device. However, it could also be implemented in the form of a hydraulic damping device.